

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
7 February 2002 (07.02.2002)

PCT

(10) International Publication Number
WO 02/11123 A3

(51) International Patent Classification⁷: G06F 17/30. (72) Inventors; and
G10H 1/00, G10L 15/02, 15/20 (75) Inventors/Applicants (for US only): WANG, Avery,
Li-Chun [US/US]; 2915 Ross Road, Palo Alto, CA 94303
(US). SMITH, Julius, O. III [US/US]; 4360 Miller
Avenue, Palo Alto, CA 94308 (US).

(21) International Application Number: PCT/EP01/08709 (74) Agent: BOYCE, Conor; F. R. Kelly & Co., 27 Clyde
Road, Ballsbridge, Dublin 4 (IE).

(22) International Filing Date: 26 July 2001 (26.07.2001) (81) Designated States (national): AE, AG, AL, AM, AT, AU,
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,
CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM,
HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK,
LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX,
MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL,
TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(25) Filing Language: English (84) Designated States (regional): ARIPO patent (GH, GM,
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian
(26) Publication Language: English

(30) Priority Data:
60/222,023 31 July 2000 (31.07.2000) US
09/839,476 20 April 2001 (20.04.2001) US

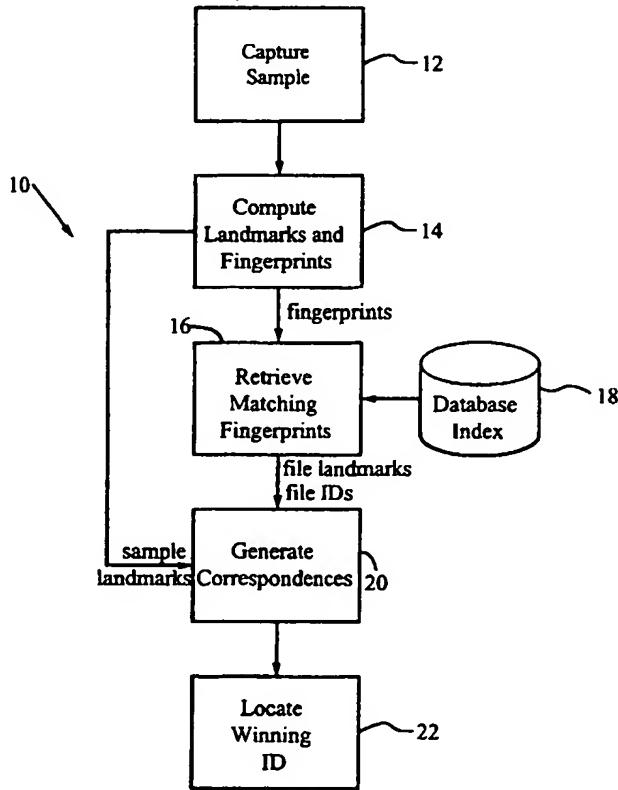
(71) Applicant (for all designated States except US): SHAZAM ENTERTAINMENT LIMITED [GB/GB]; 189 Wardour Street, Suite 22, London W1F 8ZD (GB). (84) Designated States (regional): ARIPO patent (GH, GM,
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian

[Continued on next page]

(54) Title: METHOD FOR SEARCH IN AN AUDIO DATABASE



WO 02/11123 A3



(57) Abstract: A method for recognizing an audio sample locates an audio file that most closely matches the audio sample from a database indexing a large set of original recordings. Each indexed audio file is represented in the database index by a set of landmark timepoints and associated fingerprints. Landmarks occur at reproducible locations within the file, while fingerprints represent features of the signal at or near the landmark timepoints. To perform recognition, landmarks and fingerprints are computed for the unknown sample and used to retrieve matching fingerprints from the database. For each file containing matching fingerprints, the landmarks are compared with landmarks of the sample at which the same fingerprints were computed. If a large number of corresponding landmarks are linearly related, i.e., if equivalent fingerprints of the sample and retrieved file have the same time evolution, then the file is identified with the sample. The method can be used for any type of sound or music, and is particularly effective for audio signals subject to linear and nonlinear distortion such as background noise, compression artifacts, or transmission dropouts. The sample can be identified in a time proportional to the logarithm of the number of entries in the database; given sufficient computational power, recognition can be performed in nearly real time as the sound is being sampled.



patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BE, BJ, CE, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(iii)) for the following designations AM, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LU, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE,

DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BE, BJ, CE, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii)) for all designations of inventorship (Rule 4.17(iv)) for US only

Published:

with international search report

before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

(88) Date of publication of the international search report:

30 May 2002

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

Int'l Application No
PCT/EP 01/08709

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 G06F17/30 G10H1/00 G10L15/02 G10L15/20

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G06F G10H G10L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>US 4 852 181 A (MORITO ET AL) 25 July 1989 (1989-07-25)</p> <p>abstract; figures 4,6,7,9,11 column 2, line 30-54</p> <p>---</p> <p>-/-</p>	<p>1-3,5, 8-10,12, 19,20, 34-36, 38-41, 48-51, 76,77</p>

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *&* document member of the same patent family

Date of the actual completion of the international search

12 March 2002

Date of mailing of the International search report

19/03/2002

Name and mailing address of the ISA
European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel: (+31-70) 340-2040, Tx. 31 651 epo nl.
Fax: (+31-70) 340-3016

Authorized officer

Quélavoine, R

INTERNATIONAL SEARCH REPORT

Int'l Application No
PCT/EP 01/08709

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	LIU S A: "LANDMARK DETECTION FOR DISTINCTIVE FEATURE-BASED SPEECH RECOGNITION" JOURNAL OF THE ACOUSTICAL SOCIETY OF AMERICA, AMERICAN INSTITUTE OF PHYSICS. NEW YORK, US, vol. 100, no. 5, 1 November 1996 (1996-11-01), pages 3417-3430, XP000641690 ISSN: 0001-4966 abstract ---	4,11, 42-47, 52-55, 68-71
A	US 5 918 223 A (BLUM ET AL) 29 June 1999 (1999-06-29) abstract; figure 7A column 3, line 22-29 ---	1-77
P,X	WO 01 04870 A (FRAGOULIS DIMITRIOS ; PANAGOPOULOS ATHANASIOS (GR); PAPAODYSSEUS CO) 18 January 2001 (2001-01-18) abstract; figures 2,4,5 page 1, line 15-25 ---	8
E	WO 01 88900 A (CREATIVE TECH LTD) 22 November 2001 (2001-11-22) figure 2 page 1, line 10-29 page 2, line 5-30 -----	1-3,5, 8-10,12, 19,20, 34-36, 38-41, 48-51, 76,77

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 01/08709

Patent document cited in search report		Publication date		Patent family member(s)		Publication date
US 4852181	A	25-07-1989	JP	62159195 A		15-07-1987
			JP	62073298 A		03-04-1987
			JP	62073299 A		03-04-1987
			JP	1753825 C		23-04-1993
			JP	4048400 B		06-08-1992
			JP	62086399 A		20-04-1987
			DE	3683343 D1		20-02-1992
			EP	0219712 A1		29-04-1987
			US	4918735 A		17-04-1990
US 5918223	A	29-06-1999		NONE		
WO 0104870	A	18-01-2001	GR	99100235 A		30-03-2001
			EP	1147511 A1		24-10-2001
			WO	0104870 A1		18-01-2001
WO 0188900	A	22-11-2001	WO	0188900 A2		22-11-2001